Entergy

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GNRO-2013/00096

December 20, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Response to Request for Additional Information (RAI) Set 48 dated November 21, 2013
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

REFERENCES:

1. U.S. NRC Letter, "Requests for Additional Information for the Review of the Grand Gulf Nuclear Station, License Renewal Application," dated November 21, 2013 (GNRI-2013/000175)

2. U.S. NRC Letter, "Requests for Additional Information for the Review of the Grand Gulf Nuclear Station, License Renewal Application," dated March 12, 2013 (GNRI-2013/00062)

Dear Sir or Madam:

Entergy Operations, Inc is providing, in the Attachment, the response to the reference 1 Request for Additional Information (RAI). The RAI's included in reference 1 include a revision to RAI B.1.41-3c that was originally requested in reference 2. Therefore a response to reference 2 is not required and will not be provided. The attachment also includes an updated listing of regulatory commitments for license renewal that have been added to Appendix A of the license renewal application. This new commitment list provided in appendix A includes new commitments 35 and 36 required in response to RAIs in this letter.

If you have any questions or require additional information, please contact Jeff Seiter at 601-437-2344.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 20th day of December, 2013.

A148
NRR

Sincerely,

Thomas Coutu
For K. Mulligan, SVP

KJM/ras

Attachment: Response to Requests for Additional Information

cc: with Attachment and Enclosures

U.S. Nuclear Regulatory Commission
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cc: without Attachment and Enclosures

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U.S. Nuclear Regulatory Commission
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NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

**Attachment to**

**GNRO-2013/00096**

**Response to Requests for Additional Information**

**RAI A.1-1, License Renewal Commitments and the USAR**

Background

By letter dated October 28, 2011, Entergy Operations, Inc. (Entergy), submitted an application pursuant to Title 10 of the Code of Federal Regulations (CFR) Part 54, to renew the operating license, NPF-29, for Grand Gulf Nuclear Station (GGNS), Unit 1, for review by the U.S. Nuclear Regulatory Commission (NRC) staff. The staff of NRC is reviewing this application in accordance with the guidance in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." By letter dated January 31, 2013, the NRC provided the "Safety Evaluation Report with Open Items related to the License Renewal of the Grand Gulf Nuclear Station" (SER), and requested that Entergy review the SER and provide comments to the NRC staff. By letter dated April 2, 2013, Entergy provided its comments. During the review of the GGNS license renewal application (LRA) by the NRC staff, Entergy made commitments related to aging management programs (AMPs), aging management reviews (AMRs), and time-limited aging analyses, as applicable, related to managing the aging effects of structures and components prior to the period of extended operation (PEO). The list of these commitments, as well as the implementation schedules and the sources for each commitment, was included as a Table in Appendix A to the SER with Open Items.

In Section 1.7, "Summary of Proposed License Conditions," of the SER with Open Items, the staff stated that following its review of the LRA, including subsequent information and clarifications provided by the applicant, it identified proposed license conditions. The first license condition requires the information in the updated safety analysis report (USAR) supplement, submitted pursuant to 10 CFR 54.21 (d), as revised during the LRA review process, be made a part of the USAR. The second license condition in part states that the new programs and enhancements to existing programs listed in Appendix A of the SER and the applicant's USAR supplement be implemented no later than 6 months prior to the PEO. This license condition also states, in part, that activities in certain other commitments shall be completed by 6 months prior to the PEO or the end of the last refueling outage prior to the PEO, whichever occurs later.

The NRC plans to revise Appendix A of the SER to align with this guidance and to reformat the license condition to be as follows:

> The USAR supplement submitted pursuant to 10 CFR 54.21 (d), as revised during the license renewal application review process, and as supplemented by Appendix A of NUREG [XXXX], "Safety Evaluation Report Related to the License Renewal of Grand Gulf Nuclear Station" dated [Month Year], describes certain programs to be implemented and activities to be completed prior to the PEO.
> a) The licensee shall implement those new programs and enhancements to existing programs no later than 6 months prior to PEO.
>
> b) The licensee shall complete those inspection and testing activities, as noted in Commitment Nos. x through xx of Appendix A of NUREG XXXX, by the 6 month date prior to PEO or the end of the last refueling outage prior to the PEO, whichever occurs later.

The licensee shall notify the NRC in writing within 30 days after having accomplished item (a) above and include the status of those activities that have been or remain to be completed in item (b) above.

The staff also notes that in the course of its evaluating multiple commitments to be implemented in the future in order to arrive at a conclusion of reasonable assurance that requirements of 10 CFR 54.29(a) have been met, these license renewal commitments must be incorporated either into a license condition or into a mandated licensing basis document, such as the USAR. Those commitments that

are incorporated into the USAR are typically done so by incorporating each one verbatim (or by a summary and a commitment reference number) into the respective USAR summaries in the applicant's LRA Appendix A.

Issue:

As proposed by the applicant and as reflected in the SER Appendix A, the implementation schedule for some commitments may conflict with the implementation schedule intended by the generic license condition. In addition, these licensing commitments need to be incorporated either into a license condition or into the applicant's USAR summary in such a manner as discussed above.

Request:

1. Identify those commitments to implement new programs and enhancements to existing programs. Indicate the expected date for completing the implementation of each of these programs and enhancements.
2. Identify those commitments to complete inspection or testing activities prior to the PEO. Indicate the expected dates for the completion of each of these inspection and testing activities.
3. For each commitment in the SER Appendix A, identify where and how Entergy proposes that it be incorporated: into either a license condition or into the GGNS USAR.

**RESPONSE TO RAI A.1-1**

**Response to request 1:**

The commitments to implement new programs and enhancements to existing programs are listed in the license renewal commitment list in new Section A.4 of LRA Appendix A (as shown below). The expected date for completing the implementation of most of these programs and enhancements is no later than May 1, 2024, which is 6 months prior to the period of extended operation. Expected date for implementation of commitments that include inspection or testing activities prior to the PEO is May 1, 2024, or the end of the last refueling outage prior to November 1, 2024, whichever is later.

References in LRA Appendices A and B do not describe actual scheduled dates; rather they indicate that the associated activities will be completed before the period of extended operation. Meeting the implementation schedule in the numbered commitment list (A.4) provided in LRA App. A will ensure that the commitments will be implemented consistent with the implementation times indicated in the text of LRA Appendices A and B.

**Response to request 2:**

Commitments to complete inspections or testing activities prior to the PEO are included in the license renewal commitment list in new Section A.4 of LRA Appendix A (as shown below). The expected date for completing the implementation of each of the commitments involving inspections or testing activities that must be completed prior to the PEO is May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. Specifically, the commitments to complete inspection or testing activities prior to the PEO are items 1, 2, 5, 8, 9, 12, 18, 19, 20, 21, 25, 29 and 32 in section A.4 below.

**Response to request 3:**

The schedule for implementation of each commitment in the SER Appendix A is in the license renewal

commitment list in new Section A.4 of LRA Appendix A (as shown below). As indicated in LRA Section A.0, the information presented in LRA Appendix A will be incorporated into the Ultimate Final Safety Analysis Report (UFSAR) following issuance of the renewed operating license.

Note: Appendix A additions are underlined.

Add the following line item to the bottom of the Appendix A Table of Contents (page A-iii)

A.4 License Renewal Commitment List.....A-42

Add the following table to the end of Appendix A (New page A-42)

## A.4 LICENSE RENEWAL COMMITMENT LIST

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| 1 | Implement the 115 kilovolt (KV) Inaccessible Transmission Cable Program for Grand Gulf Nuclear Station (GGNS) as described in License Renewal Application (LRA) Section B.1.1 | B.1.1 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |
| 2 | Implement the Aboveground Metallic Tanks Program for GGNS as described in LRA Section B.1.2 | B.1.2 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |
| 3 | Enhance the Bolting Integrity Program for GGNS to clarify the prohibition on use of lubricants containing $MoS_2$ for bolting, and to specify that proper gasket compression will be visually verified following assembly.<br><br>Enhance the Bolting Integrity Program to include consideration of the guidance applicable for pressure boundary bolting in Regulatory Guide (NUREG) 1339, Electric Power Research Institute (EPRI) NP-5769, and EPRI TR-104213.<br><br>Enhance the Bolting Integrity Program to include volumetric examination per American Society of Mechanical Engineers (ASME) Code Section IX, Table IWB-2500-1, Examination Category B-G-1, for high-strength closure bolting regardless of code classification. | B.1.3 | Prior to May 1, 2024 | GNRO-2011/00093 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| 4 | Enhance the Boraflex Monitoring Program for GGNS to perform periodic surveillances of the boraflex neutron absorbing material in the spent fuel pool and upper containment pool at least once every 5 years using Boron-10 Areal Density Gage for Evaluating Racks (BADGER) testing.<br><br>RACKLIFE analysis will continue to be performed each cycle. This analysis will include a comparison of the RACKLIFE predicted silica to the plant measured silica. This comparison will determine if adjustments to the RACKLIFE loss coefficient are merited. The analysis will include projections to the next planned RACKLIFE analysis date to ensure current Region I storage locations will not need to be reclassified as Region II storage locations in the analysis interval. | B.1.4 | Prior to May 1, 2024 | GNRO-2011/00093<br>GNRO-2012-00077 |
| 5 | Implement the Buried Piping and Tanks Inspection Program for GGNS as described in LRA Section B.1.5. Soil testing will be performed at two locations near the stainless steel condensate storage system piping that is subject to aging management review. Measured parameters will include soil resistivity, bacteria, pH, moisture, chlorides and redox potential. If the soil is determined to be corrosive then the number of inspections will be increased from one to two prior to and during the period of extended operation. | B.1.5 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093<br>GNRO-2012/00089 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| 6 | Enhance the Boiling Water Reactor (BWR) Vessel Internals Program for GGNS as follows.<br><br>(a) Evaluate the susceptibility to neutron or thermal embrittlement for reactor vessel internal components composed of CASS, X-750 alloy, precipitation-hardened (PH) martensitic stainless steel(e.g., 15-5 and 17-4 PH steel), and martensitic stainless steel (e.g., 403, 410 and 431 steel). This evaluation will include a plant-specific identification of the reactor vessel internals components made of these materials.<br><br>(b) Inspect portions of the susceptible components determined to be limiting from the standpoint of thermal aging susceptibility, neutron fluence, and cracking susceptibility (i.e., applied stress, operating temperature, and environmental conditions). The inspections will use an inspection technique capable of detecting the critical flaw size with adequate margin. The critical flaw size will be determined based on the service loading condition and service-degraded material properties. The initial inspection will be performed either prior to or within 5 years after entering the period of extended operation. If cracking is detected after the initial inspection, the frequency of re-inspection will be justified based on fracture toughness properties appropriate for the condition of the component. The sample size for the initial inspection of susceptible components will be 100% of the accessible component population, excluding components that may be in compression during normal operations. | B.1.11 | Prior to May 1, 2024 | GNRO-2011/00093<br><br>GNRO-2012/00137<br><br>GNRO-2012/00137 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| 7 | Enhance the Compressed Air Monitoring Program for GGNS to apply a consideration of the guidance of ASME OM-S/G-1998, Part 17; ANSI/ISA-S7.0.01-1996; EPRI NP-7079; and EPRI TR-108147 to the limits specified for air system contaminants.<br><br>Enhance the Compressed Air Monitoring Program to include periodic and opportunistic inspections of accessible internal surfaces of piping, compressors, dryers, aftercoolers, and filters to apply consideration of the guidance of ASME OM-S/G-1998, Part 17 for inspection frequency and inspection methods of these components in the following compressed air systems.<br><br>• Automatic Depressurization System (ADS) air<br><br>• Division 1 Diesel Generator Starting Air (D1DGSA)<br><br>• Division 2 Diesel Generator Starting Air (D2DGSA)<br><br>• Division 3 Diesel Generator Starting Air (D3DGSA), also known as the HPCS Diesel Generator<br><br>• Instrument Air (IA) | B.1.12 | Prior to May 1, 2024 | GNRO-2011/00093 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| 8 | Enhance the Diesel Fuel Monitoring Program to include a ten-year periodic cleaning and internal inspection of the fire water pump diesel fuel oil tanks, the diesel fuel oil day tanks for Divisions I, II, III, and the diesel fuel oil drip tanks for Divisions I, II. These cleanings and internal inspections will be performed at least once during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals. If visual inspection is not possible, a volumetric inspection will be performed.<br><br>Enhance the Diesel Fuel Monitoring Program to include a volumetric examination of affected areas of the diesel fuel tanks if evidence of degradation is observed during visual inspection. The scope of this enhancement includes the diesel fuel oil day tanks (Divisions I, II, III), the diesel fuel oil storage tanks (Divisions I, II, III), the diesel fuel oil drip tanks (Divisions I, II), and the diesel fire pump fuel oil storage tanks, and is applicable to the inspections performed during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals. | B.1.16 | Prior to May 1, 2014 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |
| 9 | Enhance the External Surfaces Monitoring Program to include instructions for monitoring of the aging effects for flexible polymeric components through manual or physical manipulation of the material, including a sample size for manipulation of at least 10 percent of available surface area.<br><br>Enhance the External Surfaces Monitoring Program as follows.<br><br>1. Underground components within the scope of this program will be clearly identified in program documents.<br><br>2. Instructions will be provided for inspecting all underground components within the scope of this program during each 5 year period, beginning 10 years prior to entering the period of extended operation. | B.1.18 | Prior to May 1, 2014 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093<br><br>GNRO-2013/00021 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| 10 | Enhance the Fatigue Monitoring Program to monitor and track all critical thermal and pressure transients for all components that have been identified to have a fatigue Time Limited Aging Analysis (TLAA).<br><br>Enhance the Fatigue Monitoring Program to perform a review of the GGNS high energy line break analyses and the corresponding tracking of associated cumulative usage factors to ensure the GGNS program adequately manages fatigue usage for these locations.<br><br>Fatigue usage calculations that consider the effects of the reactor water environment will be developed for a set of sample reactor coolant system components. This sample set will include the locations identified in NUREG/CR-6260 and additional plant-specific component locations in the reactor coolant pressure boundary if they are found to be more limiting than those considered in NUREG/CR-6260. $F_{en}$ factors will be determined using the formulae sets listed in Section 4.3.3. If necessary following this analysis, revised cycle limits will be incorporated into the Fatigue Monitoring Program documentation.<br><br>Enhance the Fatigue Monitoring Program to provide updates of the fatigue usage calculations on an as-needed basis if an allowable cycle limit is approached, or in a case where a transient definition has been changed, unanticipated new thermal events are discovered, or the geometry of components have been modified. The program revision will include providing for the consideration of the recirculation pump fatigue analysis exemption validity if cycles that were input into the exemption evaluation exceed their limits. | B.1.19 | Prior to November 1, 2022 | GNRO-2011/00093<br><br>GNRO-2012/00063 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| 11 | Enhance the Fire Protection Program to require visual inspections of the Halon/CO2 fire suppression system at least once every fuel cycle to examine for signs of corrosion.<br><br>Enhance the Fire Protection Program to require visual inspections of fire damper framing at least once every fuel cycle to check for signs of degradation.<br><br>Enhance the Fire Protection Program to require visual inspection of concrete curbs, manways, hatches, manhole covers, hatch covers, and roof slabs at least once every fuel cycle to confirm that aging effects are not occurring.<br><br>Enhance the Fire Protection Program to require an external visual inspection of the CO2 tank at least once every fuel cycle to examine for signs of corrosion. | B.1.20 | Prior to May 1, 2024 | GNRO-2011/00093<br><br>GNRO-2012/00042 |
| 12 | Enhance the Fire Water Program to include inspection of hose reels for degradation. Acceptance criteria will be enhanced to verify no unacceptable degradation.<br><br>Enhance the Fire Water Program to include one of the following options.<br>(1) Wall thickness evaluations of fire protection piping using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material will be performed prior to the period of extended operation and at periodic intervals thereafter. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.<br>OR<br><br>(2) A visual inspection of the internal surface of fire protection piping will be performed upon each entry to the system for routine or corrective maintenance. These inspections will be capable of evaluating (a) wall thickness to ensure against catastrophic failure and (b) the inner diameter of the piping as it applies to the design flow of the fire protection system. Maintenance history shall be used to demonstrate that such | B.1.21 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093<br><br>GNRO-2012/00089 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| | inspections have been performed on a representative number of locations prior to the period of extended operation. A representative number is 20% of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Additional inspections will performed as needed to obtain this representative sample prior to the period of extended operation. The periodicity of inspections during the period of extended operation will be determined through an engineering evaluation of the operating experience gained from the results of previous inspections of fire water piping.<br><br>Enhance the Fire Water Program to include a visual inspection of a representative number of locations on the interior surface of below grade fire protection piping in at least one location at a frequency of at least once every 10 years during the period of extended operation. A representative number is 20% of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Acceptance criteria will be revised to verify no unacceptable degradation.<br><br>Enhance the Fire Water Program to test or replace sprinkler heads. If testing is chosen a representative sample of sprinkler heads will be tested before the end of the 50-year sprinkler head service life and at 10-year intervals thereafter during the period of extended operation. Acceptance criteria will be no unacceptable degradation. NFPA-25 defines a representative sample of sprinklers to consist of a minimum of not less than 4 sprinklers or 1 percent of the number of sprinklers per individual sprinkler sample, whichever is greater. If replacement of the sprinkler heads is chosen, all sprinklers that have been in service for 50 years will be replaced.<br><br>Enhance the Fire Water Program to include visual inspection of spray and sprinkler system internals for evidence of degradation. Acceptance criteria will be enhanced to verify no unacceptable degradation. | | | GNRO-2012-00064 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| 13 | Enhance the Flow-Accelerated Corrosion Program to revise program documentation to specify that downstream components are monitored closely to mitigate any increased wear when susceptible upstream components are replaced with resistant materials, such as high Cr material. | B.1.22 | Prior to May 1, 2024 | GNRO-2011/00093 |
| 14 | Enhance the Inservice Inspection - IWF Program to address inspections of accessible sliding surfaces.<br><br>Enhance the Inservice Inspection - IWF Program to; clarify that parameters monitored or inspected will include corrosion; deformation; misalignment of supports; missing, detached, or loosened support items; improper clearances of guides and stops; and improper hot or cold settings of spring supports and constant load supports. Accessible areas of sliding surfaces will be monitored for debris, dirt, or indications of excessive loss of material due to wear that could prevent or restrict sliding as intended in the design basis of the support. Structural bolts will be monitored for corrosion and loss of integrity of bolted connections due to self-loosening and material conditions that can affect structural integrity. High-strength structural bolting (actual measured yield strength greater than or equal to 150 ksi or 1,034 MPa in sizes greater than 1 inch nominal diameter) susceptible to stress corrosion cracking (SCC) will be monitored for SCC. When a component support is found with minor age-related degradation, but still is evaluated as "acceptable for continued service" as defined in IWF-3400, the program owner may choose to repair the degraded component and substitute a randomly selected component that is more representative of the general population for it in subsequent inspections.<br><br>Enhance the Inservice Inspection - IWF Program to clarify that detection of aging effects will include:<br><br>a) Monitoring structural bolting (American Society for Testing Materials (ASTM) A-325, ASTM F1852, and ASTM A490 bolts) and anchor bolts for loss of material, loose or missing nuts, loss of pre-load and cracking of concrete around the anchor bolts. | B.1.24 | Prior to May 1, 2024 | GNRO-2011/00093<br><br>GNRO-2012/00105<br><br>GNRO-2012/00114 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| | b) Volumetric examination comparable to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 for high strength structural bolting to detect cracking in addition to the VT-3 examination. This volumetric examination may be waived with adequate plant-specific justification.<br><br>c) Identification of all component supports that contain high strength bolting (actual measured yield greater than or equal to 150 ksi) in sizes greater than 1 inch nominal diameter. The extent of examination for support types that contain high-strength bolting will be as specified in ASME Code Section XI, Table IWF-2500-1. GGNS will examine high-strength structural bolting on the frequency specified in ASME Code Section XI, Table IWF-2500-1.<br><br>Enhance the Inservice Inspection - IWF Program acceptance criteria to include the following as unacceptable conditions.<br><br>a) Loss of material due to corrosion or wear, which reduces the load bearing capacity of the component support;<br>b) Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support; and<br>c) Cracked or sheared bolts, including high strength bolts, and anchors.<br><br>Enhance the Inservice Inspection - IWF Program preventive action to include the following.<br><br>Incorporate into plant procedures recommendations delineated in NUREG-1339, and Electric Power Research Institute (EPRI) NP-5769 and TR-104213 for high-strength structural bolting. These recommendations should address proper selection of bolting material, proper installation torque or tension, and the use of appropriate lubricants and sealants. | | | GNRO-2012/00055<br>GNRO-2012/00114<br><br>GNRO-2011/00093<br><br>GNRO-2012/00114 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| 15 | Enhance the Inspection of Overhead Heavy Load and Light Load Handling Systems Program to include monitoring of rails in the rail system for the aging effect "wear", and structural connections/bolting for loose or missing bolts, nuts, pins or rivets. Additionally, the program will be clarified to include visual inspection of structural components and structural bolts for loss of material due to various mechanisms and structural bolting for loss of preload due to self-loosening.<br><br>Enhance the Inspection of Overhead Heavy Load and Light Load Handling Systems Program acceptance criteria to state that any significant loss of material for structural components and structural bolts, and significant wear of rails in the rail system, is evaluated according to ASME B30.2 or other applicable industry standard in the ASME B30 series. | B.1.25 | Prior to May 1, 2024 | GNRO-2011/00093 |
| 16 | Implement the Internal Surfaces in Miscellaneous Piping and Ducting Components Program as described in LRA Section B.1.26. | B.1.26 | Prior to May 1, 2024 | GNRO-2011/00093 |
| 17 | Enhance the Masonry Wall Program to clarify that parameters monitored or inspected will include monitoring gaps between the supports and masonry walls that could potentially affect wall qualification.<br><br>Enhance the Masonry Wall Program to clarify that detection of aging effects require masonry walls to be inspected every 5 years. | B.1.27 | Prior to May 1, 2024 | GNRO-2011/00093 |
| 18 | Implement the Non-EQ Cable Connections Program as described in LRA Section B.1.28 | B.1.28 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| 19 | Enhance the Non environmentally Qualified (Non-EQ) Inaccessible Power Cables (400V to 35kV) Program to include low-voltage (400V to 2kV) power cables.<br><br>Enhance the Non-EQ Inaccessible Power Cables (400V to 35kV) Program to include condition-based inspections of manholes not automatically dewatered by a sump pump being performed following periods of heavy rain or potentially high water table conditions, as indicated by river level.<br><br>Enhance the Non-EQ Inaccessible Power Cables (400V to 35kV) Program to clarify that the inspections will include direct observation that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and that dewatering/drainage systems (i.e., sump pumps) and associated alarms if applicable operate properly. | B.1.29 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |
| 20 | Implement the Non-EQ Instrumentation Circuits Test Review Program as described in LRA Section B.1.30. | B.1.30 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |
| 21 | Implement the Non-EQ Insulated Cables and Connections Program as described in LRA Section B.1.31. | B.1.31 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |
| 22 | Enhance the Oil Analysis Program to provide a formalized analysis technique for particulate counting.<br><br>Enhance the Oil Analysis Program to include piping and components within the main generator system (N41) with an internal environment of lube oil. | B.1.32 | Prior to May 1, 2024 | GNRO-2011/00093 |
| 23 | Implement the One-Time Inspection Program as described in LRA Section B.1.33. | B.1.33 | Within the 10 years prior to November 1, 2024 | GNRO-2011/00093 |
| 24 | Implement the One-Time Inspection – Small Bore Piping Program as described in LRA Section B.1.34. | B.1.34 | Within the 6 years prior to November 1, 2024 | GNRO-2011/00093 |
| 25 | Enhance the Periodic Surveillance and Preventive Maintenance Program to include all activities described in the table provided in LRA Section B.1.35 program description. | B.1.35 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
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| 26 | Enhance the Protective Coating Program to include parameters monitored or inspected by the program per the guidance provided in ASTM D5163-08.<br><br>Enhance the Protective Coating Monitoring and Maintenance Program to provide for inspection of coatings near sumps or screens associated with the Emergency Core Cooling System.<br><br>Enhance the Protective Coating Program to include acceptance criteria per ASTM D 5163-08. | B.1.36 | Prior to May 1, 2024 | GNRO-2011/00093 |
| 27 | Ensure that the additional requirements of the ISP(E) specified in BWRVIP-86, Revision 1, including the conditions of the final NRC safety evaluation for BWRVIP-116 incorporated in BWRVIP-86, Revision 1 will be addressed before the period of extended operation.<br><br>Ensure that new fluence projections through the period of extended operation and the latest vessel beltline ART Tables are provided to the BWRVIP prior to the period of extended operation. | B.1.38 | Prior to May 1, 2024 | GNRO-2011/00093<br><br>GNRO-2012/00081<br><br>GNRO-2012/00081 |
| 28 | Enhance the Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plant Program to clarify that detection of aging effects will monitor accessible structures on a frequency not to exceed 5 years consistent with the frequency for implementing the requirements of RG 1.127.<br><br>Enhance the RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plant Program to perform periodic sampling, testing, and analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least every 5 years.<br><br>Enhance the RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plant Program acceptance criteria to include quantitative acceptance criteria for evaluation and acceptance based on the guidance provided in ACI 349.3R. | B.1.39 | Prior to May 1, 2024 | GNRO-2011/00093 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| 29 | Implement the Selective Leaching Program as described in LRA Section B.1.40. | B.1.40 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2011/00093 |
| 30 | Enhance the Structures Monitoring Program to clarify that the scope includes the following:<br><br>a) In-scope structures and structural components.<br><br>• Containment Building (GGN 2)<br>• Control House – Switchyard<br>• Culvert No. 1 and drainage channel<br>• Manholes and Ductbanks<br>• Radioactive Waste Building Pipe Tunnel<br>• Auxiliary Building (GGN2)<br>• Turbine Building (GGN2)<br><br>b) In-scope structural components<br><br>• Anchor bolts<br>• Anchorage / embedments<br>• Base plates<br>• Basin debris screen and grating<br>• Battery racks<br>• Beams, columns, floor slabs and interior walls<br>• Cable tray and cable tray supports<br>• Component and piping supports<br>• Conduit and conduit supports<br>• Containment sump liner and penetrations<br>• Containment sump structures<br>• Control room ceiling support system<br>• Cooling tower drift eliminators<br>• Cooling tower fill<br>• CST/RWST retaining basin (wall)<br>• Diesel fuel tank access tunnel slab<br>• Drainage channel<br>• Drywell electrical penetration sleeves<br>• Drywell equipment hatch<br>• Drywell floor slab (concrete)<br>• Drywell head<br>• Drywell head access manway<br>• Drywell liner plate<br>• Drywell mechanical penetration sleeves<br>• Drywell personnel access lock<br>• Drywell wall (concrete)<br>• Ductbanks | B.1.42 | Prior to May 1, 2024 | GNRO-2011/00093<br><br>GNRO-2012/00074<br><br>GNRO-2012-00095 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| | • Electrical and instrument panels and enclosures<br>• Equipment pads/foundations<br>• Exterior walls<br>• Fan stack grating<br>• Fire proofing<br>• Flood curbs<br>• Flood retention materials (spare parts)<br>• Flood, pressure and specialty doors<br>• Floor slab<br>• Foundations<br>• HVAC duct supports<br>• Instrument line supports<br>• Instrument racks, frames and tubing trays<br>• Interior walls<br>• Main steam pipe tunnel<br>• Manholes<br>• Manways, hatches, manhole covers, and hatch covers<br>• Metal siding<br>• Missile shields<br>• Monorails<br>• Penetration sealant (flood, radiation)<br>• Penetration sleeves (mechanical/ electrical not penetrating primary containment boundary)<br>• Pipe whip restraints<br>• Pressure relief panels<br>• Reactor pedestal<br>• Reactor shield wall (steel portion)<br>• Roof decking<br>• Roof hatches<br>• Roof membrane<br>• Roof slabs<br>• RPV pedestal sump liner and penetrations<br>• Seals and gaskets (doors, manways and hatches)<br>• Seismic isolation joint<br>• Stairway, handrail, platform, grating, decking, and ladders<br>• Structural bolting<br>• Structural steel, beams columns, and plates<br>• Sumps and Sump liners<br>• Support members: welds; bolted connections; support anchorages to building structure<br>• Support pedestals<br>• Transmission towers (see Note 1) | | | |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| | • Upper containment pool floor and walls<br>• Vents and louvers<br>• Weir wall liner plate<br><br>Note 1: The inspections of these structures may be performed by the transmission personnel. However, the results of the inspections will be provided to the GGNS Structures Monitoring Program owner for review.<br><br>c) Clarify the term "significant degradation" to include "that could lead to loss of structural integrity".<br>d) Include guidance to perform periodic sampling, testing, and analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least every 5 years.<br><br>Enhance the Structures Monitoring Program to clarify that parameters monitored or inspected include:<br><br>a) inspection for missing nuts for structural connections.<br>b) monitoring sliding/bearing surfaces such as Lubrite plates for loss of material due to wear or corrosion, debris, or dirt. The program will be enhanced to include monitoring elastomeric vibration isolators and structural sealants for cracking, loss of material, and hardening.<br>c) Include periodically inspecting the leak chase system associated with the upper containment pool and spent fuel pool to ensure the tell-tales are free of significant blockage. The inspection will also inspect concrete surfaces for degradation where leakage has been observed, in accordance with this Program.<br><br>Enhance the Structures Monitoring Program to clarify that detection of aging effects will:<br><br>a) include augmented inspections of vibration isolators by feel or touch to detect hardening if the vibration isolation function is suspect.<br><br>b) Require inspections every 5 years for structures and structural components | | | GNRO-2012/00054<br><br>GNRO-2011/00093<br><br>GNRO-2012/00098 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| | within the scope of license renewal.<br><br>c) Require direct visual examinations when access is sufficient for the eye to be within 24-inches of the surface to be examined and at an angle of not less than 30° to the surface. Mirrors may be used to improve the angle of vision and accessibility in constricted areas.<br><br>d) Specify that remote visual examination may be substituted for direct examination. For all remote visual examinations, optical aids such as telescopes, borescopes, fiber optics, cameras, or other suitable instruments may be used provided such systems have a resolution capability at least equivalent to that attainable by direct visual examination.<br><br>e) Include instructions to augment the visual examinations of roof membranes, and seals and gaskets (doors, manways, and hatches) with physical manipulation of at least 10 percent of available surface area.<br><br>Enhance the Structures Monitoring Program acceptance criteria by prescribing acceptance criteria based on information provided in industry codes, standards, and guidelines including NEI 96-03, ACI 201.1R-92, ANSI/ASCE 11-99 and ACI 349.3R-96. Industry and plant-specific operating experience will also be considered in the development of the acceptance criteria. | | | GNRO-2012/00054<br><br>GNRO-2012/00054<br><br>GNRO-2012/00076<br><br>GNRO-2011/00093 |
| 31 | Enhance the Water Chemistry Control – Closed Treated Water Program to provide a corrosion inhibitor for the engine jacket water on the engine-driven fire water pump diesel in accordance with industry guidelines and vendor recommendations.<br><br>Enhance the Water Chemistry Control – Closed Treated Water Program to provide periodic flushing of the engine jacket water and cleaning of heat exchanger tubes for the engine-driven fire water pump diesel in accordance with industry guidelines and vendor recommendations.<br><br>Enhance the Water Chemistry Control – Closed Treated Water Program to provide testing of the engine jacket water for the engine-driven fire water pump diesels at least | B.1.44 | Prior to May 1, 2024 | GNRO-2011/00093 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| | annually.<br><br>Enhance the Water Chemistry Control – Closed Treated Water Program to revise the water chemistry procedure for closed treated water systems to align the water chemistry control parameter limits with those of EPRI 1007820.<br><br>Enhance the Water Chemistry Control – Closed Treated Water Program to conduct inspections whenever a boundary is opened for the following systems.<br><br>• Drywell chilled water (DCW – system P72)<br>• Plant chilled water (PCW – system P71)<br>• Diesel generator cooling water subsystem for Division I and II standby diesel generators<br>• Diesel engine jacket water for engine-driven fire water pump<br>• Diesel generator cooling water subsystem for Division III (HPCS) diesel generator<br>• Turbine building cooling water (TBCW– system P43)<br>• Component cooling water (CCW – system P42)<br><br>These inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, and other plant-specific inspection and personnel qualification procedures that are capable of detecting corrosion or cracking.<br><br>Enhance the Water Chemistry Control – Closed Treated Water Program to inspect a representative sample of piping and components at a frequency of once every ten years for the following systems.<br><br>• Drywell chilled water (DCW – P72)<br>• Plant chilled water (PCW – P71)<br>• Diesel generator cooling water subsystem for Division I and II standby diesel generators<br>• Diesel engine jacket water for engine-driven fire water pump<br>• Diesel generator cooling water subsystem for Division III (HPCS) diesel generator | | | GNRO-2012/00049 |

| Item Number | COMMITMENT | LRA SECTION | IMPLEMENTATION SCHEDULE | SOURCE |
|---|---|---|---|---|
| | • Turbine building cooling water (TBCW – P43)<br>• Component cooling water (CCW – P42)<br><br>Components inspected will be those with the highest likelihood of corrosion or cracking. A representative sample is 20% of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components. The inspection methods will be in accordance with applicable ASME Code requirements, industry standards, or other plant specific inspection and personnel qualification procedures that ensure the capability of detecting corrosion or cracking. | | | |
| 32 | Enhance the BWR CRD Return Line Nozzle Program to include inspection of the CRD return line nozzle inconel end cap to carbon steel safe end dissimilar metal weld once prior to the period of extended operation and every 10 years thereafter. | B.1.6 | Prior to May 1, 2024 or the end of the last refueling outage prior to November 1, 2024, whichever is later. | GNRO-2012/00029 |
| 33 | Enhance the BWR Penetrations Program to include that site procedures which implement the guidelines of BWRVIP-47-A will be clarified to indicate that the guidelines of BWRVIP-47-A apply without exceptions. | B.1.8 | Prior to May 1, 2024 | GNRO-2012/00029 |
| 34 | Deleted | | | GNRO-2013/00028 |
| 35 | Enhance the Service Water Integrity Program to revise Service Water Integrity Program documents to include inspections for loss of material due to erosion. | B.1.41 | Prior to May 1, 2024 | GNRO-2013/00096 |
| 36 | Enhance the Flow Accelerated Corrosion Program to revise program documentation to specify that components subject to wall-thinning mechanisms other than FAC, which are replaced with alternate materials (e.g. replacing a carbon steel pipe with stainless steel) shall continue to be periodically monitored at a frequency commensurate with their post-replacement wear rates and operating times. | B.1.22 | Prior to May 1, 2024 | GNRO-2013/00096 |

**RAI B.1.41-3c, Service Water Integrity Program Follow-up (revised RAI)**

Background:

GGNS LRA Sections A.1.41 and B.1.41 state that the Service Water Integrity program "manages loss of material and fouling in open-cycle cooling water systems as described in the GGNS response to NRC Generic Letter (GL) 89-13." The GGNS response to GL 89-13, Action III, Item 7, "Erosion Monitoring and Control," states that the standby service water system (SSW) does not meet the selection criteria for erosion monitoring. Based on this, the Service Water Integrity program as described in the LRA does not manage erosion. (Note: The request for additional information (RAI) as presented here supersedes the previous version of RAI B.1.41-3c originally issued by letter dated March 12, 2013.)

In contrast, GGNS EP-08-LRD02, "Operating Experience Review Report- AERM," identifies more than 20 condition reports (CRs) that address erosion. The associated evaluations in the report state that loss of material due to erosion is an identified aging effect for carbon steel components in raw water or treated water environments. The report evaluates erosion found in valve 1P41F299A through CR-GGN-2007-00370 by noting that this operating experience requires special consideration to specific components in the SSW system. In addition, the NRC independently identified several CRs (e.g., CR-GGN-2003-02331 and CR-GGN-2010-01344) addressing erosion that appear to indicate that MS 46 is the procedure that monitors the associated components for erosion. During the AMP audit, the staff requested and GGNS provided a copy of GGNS MS 46, "Program Plan for Monitoring Internal Erosion/Corrosion in Moderate Energy Piping Components (Safety-Related)."

GGNS identified erosion in its operating experience reviews, but did not reference MS-46 in GGNS EP-08-LRD06, "Aging Management Program Evaluation Report Non-Class I Mechanical," which was used as the basis for LRA Appendix B. Consequently, the NRC submitted an initial RAI (RAI B.1.41-3) concerning the applicability of MS-46 to GGNS' AMPs. GGNS initially stated that the GGNS-MS-46 procedure is not an AMP that is necessary or credited to manage the effects of aging for components in the Service Water Integrity program. However, this statement appeared to be inconsistent with information in another RAI response, so the staff submitted a second RAI, B.1.41-3a, requesting further clarification for the applicability of MS-46. In its response to the second RAI, GGNS stated that MS-46 provides instructions for implementing inspections of components subject to an AMR and that these inspections are ongoing monitoring activities that are credited by the Fire Water System, Water Chemistry Control- Closed Treated Water Systems, and the Service Water Integrity AMPs.

After reviewing the second response, the staff had the following concerns: 1) the site documentation appeared to be incomplete because MS 46 was not included as a reference for three cited AMPs, 2) the LRA states the cited AMPs are consistent with the corresponding GALL Report AMP; however, none of these Generic Aging Lessons Learned (GALL) Report AMPs manage loss of material due to erosion, and 3) the LRA tables corresponding to the cited AMPs do not contain any AMR items that address loss of material due to erosion. Based on these concerns the staff issued a third RAI, B.1.41-3b, asking for additional clarification.

In its third response, dated December 18, 2012, GGNS stated that it had revised the appropriate sections of GGNS EP-08-LRD06, "Aging Management Program Evaluation Report Non-Class I Mechanical," to identify MS-46 as an implementing procedure for monitoring microbiologically influenced corrosion (MIC) for the three cited AMPs. GGNS also stated that 1) MS-46 is not credited with managing loss of material due to erosion on components within the scope of license renewal, 2) MS-46 does not reflect the systems and components that are addressed by this procedure and requires revision to update its purpose and scope, 3) MS-46 does not describe components that are subject to loss of material due to erosion, and 4) there are no recent monitoring activities performed through MS-

3. For any components previously monitored for erosion through MS-46 (i.e., components from the database that was developed and maintained in accordance with MS-46, step 5.1.1 ), discuss whether these components are currently being monitored for erosion or provide information to demonstrate that the component no longer needs to be monitored. For any components that are currently being monitored for erosion, provide the most recent inspection information (such as the date of last inspection, wall thickness data (i.e., nominal, minimum found, and minimum required), calculated wear rate, and the next scheduled inspection) or other objective evidence to show that the associated effects of aging will be adequately managed.
4. Regarding the revision to be made to MS-46 (that was previously entered into the correction action program), either include this enhancement to the program as a license renewal commitment, or delineate why the required changes to this aging management implementing procedure does not need to be verified as part of NRC Inspection Procedure 71003, "Post-Approval Site Inspection for License Renewal." In addition, clarify whether the revision to MS 46 is limited to updating the purpose and scope for managing MIC (as initially stated in letter dated December 18, 2012), or whether the update will include the erosion mechanism as well.

**RESPONSE TO RAI B.1.41-3c**

**Response to request 1:**

LRA Section B.1.41 describes the Service Water Integrity Program. The GGNS program will include inspections for loss of material due to erosion. LRA sections A.1.41 and B.1.41 are revised as follows. Additions are underlined and deletions are lined through.

**A.1.41 Service Water Integrity Program**

The Service Water Integrity Program manages loss of material and fouling in open-cycle cooling water systems as described in the GGNS response to NRC GL 89-13. The program also includes inspections for loss of material due to erosion. In addition, the program includes inspections of coatings for submerged piping in the standby service water (SSW) basin. The frequency of these inspections is based on the inspection results.

The Service Water Integrity Program will be enhanced as follows.

- Revise Service Water Integrity Program documents to include inspections for loss of material due to erosion.

This enhancement will be implemented prior to May 1, 2024.

**B.1.41 SERVICE WATER INTEGRITY**

**Program Description**

The Service Water Integrity Program is an existing program that manages loss of material and fouling in open-cycle cooling water systems as described in the GGNS response to NRC GL 89-13. The program also includes inspections for loss of material due to erosion. In addition, the program includes inspections of coatings for submerged piping in the standby service water (SSW) basin.

46. GGNS noted that the required revision to MS-46 to update its purpose and scope for managing MIC had been entered into its corrective action program.

As a result of NRC questions during a predecisional enforcement conference, GGNS subsequently stated in letter dated August 8, 2013, that it had provided conflicting information in its third response. GGNS stated that it had incorrectly stated that it does not credit MS-46 for managing loss of material due to erosion. The letter states "[p]rocedure GGNS-MS-46 is applicable for monitoring erosion in raw water systems susceptible to microbiologically influenced corrosion." The staff understood this to mean that MS 46 does manage loss of material due to erosion.

Issue:

Based on the program description in the LRA in conjunction with its response to GL 89-13, the GGNS Service Water Integrity program does not appear to manage loss of material due to erosion. In addition, based on the response to RAI B.1.41-3b, it is not clear to the staff how GGNS manages loss of material due to erosion that is documented and evaluated in EP-08-LRD02, "Operating Experience Review Report- AERM." While it may be true, as stated in EP-08-LRD02, that "loss of material due to erosion is an aging effect identified in mechanical tools for carbon steel," the mechanical tools document (EPRI-1010639) also states that there is no corresponding GALL Report item and there is not a match between the tool and the GALL Report for components in either raw water or treated water environments. As such, if loss of material due to erosion is being managed, then an AMR item citing generic note H, designating that the aging effect is not in the GALL Report for this component, material, and environment combination, would be appropriate for components in each affected system.

Although GGNS apparently monitored erosion/corrosion in certain systems through MS-46 in the past, this appears to no longer be the case. The response to RAI B.1.41-3a states that MS 46 performs inspections of components subject to an AMR, and that these inspections are ongoing monitoring activities that are credited by several AMPs; however, the response to RAI B.1.41-3b states that no recent monitoring activities have been performed through MS-46. In addition, MS-46 apparently needs to be revised to update its purpose and scope because it does not reflect the systems and components that it addresses. Although the required revision to MS-46 is in the corrective action program, this enhancement to an aging management implementing procedure is not captured in GGNS' license renewal List of Regulatory Commitments.

Request:

1. Either update LRA Section A.1.41 and the program description in Section B.1.41 to reflect current aging management activities with respect to managing erosion, or provide justification that the program described in GGNS' response to GL 89-13, which indicates that erosion monitoring is not part of the program, adequately describes current GGNS aging management activities.
2. Describe the aging management activities at GGNS that are credited to address the operating experience evaluated in EP-08-LRD02 for loss of material due to erosion and include the AMR items in system tables where components are monitored for erosion.

   If it is determined that no new AMR items need to be added to any system tables, provide the bases to show that existing AMR items include loss of material due to erosion. For the erosion found in valve 1P41F299A through CR-GGN-2007 00370, provide details regarding what "special consideration to specific components in the SSW system" have been taken, and delineate where the special consideration has been included in the implementing procedure(s) of an AMP.

The frequency of these inspections is based on the inspection results.

**NUREG-1801 Consistency**

The Service Water Integrity Program, with enhancement, is consistent with the program described in NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System.

**Exceptions to NUREG-1801**

None

**Enhancements**

~~None~~

The following enhancement will be implemented prior to May 1, 2024.

| Elements Affected | Enhancement |
|---|---|
| 4. Detection of Aging Effects | Revise Service Water Integrity Program documents to include inspections for loss of material due to erosion. |

**Response to request 2:**

The GGNS LRA project report EP-08-LRD02, "Operating Experience Review Report - AERM" identified loss of material due to erosion for components in scope for license renewal in the following systems.

C11 CRD Hydraulic System
E12 Residual Heat Removal System
E61 Combustible Gas Control System
N11 Main and Reheat Steam System
N19 Condensate and Feedwater System
N31 Main Turbine and Auxiliaries
N33 Main and RFP Turbine Seal Steam and Drain System
N35 Moisture Separator-Reheater Vents and Drains System
N36 Extraction Steam System
N62 Condenser Air Removal System
P41 Standby Service Water System
P43 Turbine Building Cooling Water System
P44 Plant Service Water System
P64 Fire Water System
P81 HPCS Diesel Generator System

The OE report entry that cited erosion for system P64 involved corrosion on the floor of the fire water storage tank. Erosion is not a feasible mechanism at this location. Therefore, the P64 system is not addressed in the following discussion. For the remaining identified systems, the Flow-Accelerated Corrosion Program, the Periodic Surveillance and Preventive Maintenance Program, and the Service Water Integrity Program manage the aging effect of loss of material due to erosion.

- Flow-Accelerated Corrosion (FAC) Program

  The FAC Program described in LRA section B.1.22 as revised by the response to RAI B.1.22-1b in letter GNRO-2012/00156, dated December 18, 2012, manages loss of material due to erosion for components in the following systems.

  C11 CRD Hydraulic System
  E12 Residual Heat Removal System
  N11 Main and Reheat Steam System
  N19 Condensate and Feedwater System
  N31 Main Turbine and Auxiliaries
  N33 Main and RFP Turbine Seal Steam and Drain System
  N35 Moisture Separator-Reheater Vents and Drains System
  N36 Extraction Steam System
  N62 Condenser Air Removal System

LRA section B.1.22 describes the Flow-Accelerated Corrosion Program. As revised in the response to RAI B.1.22-1b in letter GNRO-2012/100156, dated December 18, 2012, the Flow-Accelerated Corrosion Program also manages loss of material due to erosion.

LRA Table 3.3.2-19-1 is revised to add a new line item to document the program that manages loss of material due to erosion in the CRD hydraulic system. Additions are underlined.

**Table 3.3.2-19-1**
**CRD Hydraulic System**
**Nonsafety-Related Components Affecting Safety-Related Systems**
**Summary of Aging Management Evaluation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Valve body | Pressure boundary | Carbon steel | Treated water (int) | Loss of material | Flow-accelerated Corrosion | -- | -- | H, 309 |

Letter GNRO-2013/00053 dated August 8, 2013, included a commitment to perform confirmatory inspections for wall-thinning on components that have been replaced with alternate materials. These confirmatory inspections do not apply to FAC-resistant materials used for replacement of components that have experienced loss of material due to FAC. To address these confirmatory inspections, LRA sections A.1.22 and B.1.22 are revised as follows. Additions are underlined and deletions are lined through.

### A.1.22 Flow-Accelerated Corrosion Program

The Flow-Accelerated Corrosion (FAC) Program manages loss of material due to wall thinning for piping and components by conducting appropriate analysis and baseline inspections, determining the extent of thinning, performing follow-up inspections, and taking corrective actions as necessary. The FAC program also manages the effects of aging due to other wall-thinning mechanisms that may be identified through industry or plant-specific operating experience. The program follows guidelines published by EPRI in NSAC-202L.

The FAC Program will be enhanced as follows.

- Revise program documentation to specify that downstream components are monitored closely to mitigate any increased wear when susceptible upstream components are replaced with resistant materials, such as high chromium material.
- Revise program documentation to specify that components subject to wall-thinning mechanisms other than FAC, which are replaced with alternate materials (e.g. replacing a carbon steel pipe with stainless steel) shall continue to be periodically monitored at a frequency commensurate with their post-replacement wear rates and operating times.

~~This enhancement~~ These enhancements will be implemented prior to the period of extended operation.

### B.1.22 FLOW-ACCELERATED CORROSION

**Enhancements**

The following enhancements will be implemented prior to the period of extended operation.

| Elements Affected | Enhancement |
|---|---|
| 7. Corrective Actions | The Flow-Accelerated Corrosion Program will be enhanced to revise program documentation to specify that downstream components are monitored closely to mitigate any increased wear when susceptible upstream components are replaced with resistant materials, such as high Cr material.<br>Revise the Flow-Accelerated Corrosion Program documentation to specify that components subject to wall-thinning mechanisms other than FAC, which are replaced with alternate materials (e.g. replacing a carbon steel pipe with stainless steel) shall continue to be periodically monitored at a frequency commensurate with their post-replacement wear rates and operating times. |

- Periodic Surveillance and Preventive Maintenance Program

  Condensate system (N19):

  LRA section B.1.35 describes the Periodic Surveillance and Preventive Maintenance Program. To clarify the use of this program for managing loss of material due to erosion, LRA sections A.1.35 and B.1.35 are revised as shown in response to request 3 of this RAI.

  Moisture Separator-Reheater Vents and Drains System (N35):

  LRA section B.1.35 describes the Periodic Surveillance and Preventive Maintenance Program. To

clarify the use of this program for managing loss of material due to erosion, LRA sections A.1.35 and B.1.35 are revised as shown in response to request 3 of this RAI. LRA Table 3.4.2-2-9 is revised to add a new line item to document the program that manages the aging effect of loss of material due to erosion in the moisture separator-reheater vents and drains system. Additions are underlined.

**Table 3.4.2-2-9**
**Moisture Separator-Reheater Vents and Drains System**
**Nonsafety-Related Components Affecting Safety-Related Systems**
**Summary of Aging Management Evaluation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Separator | Pressure boundary | Carbon steel | Treated water (int) | Loss of material | Periodic Surveillance and Preventative Maintenance | -- | -- | H, 403 |

The following plant-specific note (Note 403) for table 3.4.2-1 through table 3.4.2-2-19 is modified to remove reference to the Flow-Accelerated Corrosion Program since the added line item uses the Periodic Surveillance and Preventative Maintenance Program to manage loss of material due to erosion. Note 403 was added by RAI response in letter GNRO-2012/00156 dated 12/18/2012.

Additions are underlined and deletions are lined through.

**Notes for Table 3.4.2-1 through Table 3.4.2-2-19**

Plant-Specific Notes

403. The aging effect of loss of material used for this line item refers to ~~The Flow-Accelerated Corrosion Program also manages~~ loss of material due to erosion.

- Service Water Integrity Program

The Service Water Integrity Program manages loss of material due to erosion for components in the following systems, as described in LRA section B.1.41 with the enhancement provided in the response to request 1.

E12 Residual Heat Removal System
E61 Combustible Gas Control System
P41 Standby Service Water System
P43 Turbine Building Cooling Water System
P44 Plant Service Water System
P81 HPCS Diesel Generator System

LRA sections A.1.41 and B.1.41 are revised as shown in the response to request 1 of this RAI to describe that the Service Water Integrity Program will manage the aging effect of loss of material due to erosion.

LRA Table 3.3.2-16 is revised to add a line item to document the program that manages the aging

effect of loss of material due to erosion in the HPCS diesel generator system. Additions are underlined.

**Table 3.3.2-16**
**HPCS Diesel Generator System**
**Summary of Aging Management Evaluation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Heat exchanger (bonnet) | Pressure boundary | Carbon steel | Raw water (int) | Loss of material | Service Water Integrity | -- | -- | H, 309 |

The following plant-specific note (Note 309) for table 3.3.2-1 through table 3.3.2-19-37 is modified to remove reference to the Flow-Accelerated Corrosion Program since the added line item uses the Service Water Integrity Program to manage loss of material due to erosion. Note 309 was added by RAI response in letter GNRO-2012/00156 dated 12/18/2012. Additions are underlined and deletions are lined through.

**Notes for Table 3.3.2-1 through Table 3.3.2-19-37**

Plant-Specific Notes

309. The aging effect of loss of material used for this line item refers to ~~The Flow-Accelerated Corrosion Program also manages~~ loss of material due to erosion.

Discussion of 1P41F299A:

The loss of material identified in valve 1P41F299A and documented in CR-GGN-2007-00370 was loss of material due to erosion. The "special consideration to specific components in the SSW system" phrase used in the evaluation of this operating experience referred to the need during the aging management review (AMR) of the standby service water system (P41) to ensure that credited aging management programs could effectively manage loss of material due to erosion for this valve and downstream piping. Based on the documented operating experience, erosion was identified during the AMR of the standby service water system as a mechanism contributing to loss of material. The Service Water Integrity Program, as clarified in the enhancement provided in the response to request 1, manages loss of material due to erosion.

**Response to request 3:**

The database developed and maintained in accordance with GGNS-MS-46, step 5.1.1, contains historical data for locations in raw and treated water systems. This database contains entries for the following GGNS systems.

- N71 circulating water system
- P11 condensate and refueling water storage and transfer system
- P41 standby service water system
- P44 plant service water system
- P47 plant service water radial well
- P64 fire protection water system

The database includes locations in the N71 circulating water system that are on the piping adjacent

to the high pressure, intermediate pressure, and low pressure condenser shells. In addition, there are four N71 components in the MS-46 database that are located in the circulating water pump house. The circulating water pump house is not in the scope of license renewal and therefore the N71 components located in the circulating water pump house are not addressed in this response. P47 plant service water radial well system components listed in this database are not in the scope of license renewal and, therefore, are not addressed in this response.

The following discusses management of loss of material due to erosion for each of the systems.

- N71 The Periodic Surveillance and Preventive Maintenance (PSPM) Program manages loss of material due to erosion for GGNS-MS-46 database N71 system entries as identified in the Table 3.4.2-2-18 line item for carbon steel piping with internal environment of raw water. The PSPM Program description revision is provided below in the response to this request.

- P11 One entry in the MS-46 database was added due to a valve set point adjustment during the 2003 timeframe. Erosion was not the reason for the added line item in the database, and there is no operating experience that indicates erosion in this system. Thus, no LRA table line item for the aging effect of loss of material due to erosion is provided for this system.

- P41 The Service Water Integrity Program manages loss of material due to erosion for GGNS-MS-46 database entries for the P41 system as identified in the Table 3.3.2-7 line items for carbon steel piping and valve body with internal environment of raw water.

- P44 The Service Water Integrity Program manages loss of material due to erosion for GGNS-MS-46 database entries for the P44 system as identified in the Table 3.3.2-9 line item for carbon steel piping with internal environment of raw water.

- P64 The fire protection water system components listed in the MS-46 database are in stagnant portions of the system where loss of material due to erosion is not an aging effect requiring management. These components suffered loss of material due to corrosion. The Fire Water System manages loss of material due to corrosion as identified in the Table 3.3.2-12 line item for carbon steel piping with internal environment of raw water. Thus, no LRA table line item for loss of material due to erosion is provided.

The above programs include the piping and components listed in the GGNS-MS-46 database that are within the scope of license renewal and subject to aging management review. Some piping and components have been replaced with more erosion-resistant materials. Those items are retained to confirm the erosion issues have been resolved.

LRA sections A.1.35 and B.1.35 are revised as follows to add a description of these activities to the program description. Additions are underlined.

**A.1.35 <u>Periodic Surveillance and Preventive Maintenance Program</u>**

The Periodic Surveillance and Preventive Maintenance Program manages aging effects not managed by other aging management programs, including loss of material <u>due to erosion</u>, cracking, and change in material properties.

Inspections occur at least once every five years during the period of extended operation. Visual or other Non-Destructive Examination (NDE) inspections of components in the low pressure core spray, residual heat removal, pressure relief, reactor core isolation cooling, high pressure core spray, and floor and equipment drains systems, and the containment building gaskets/seals are performed every five years. Visual or other NDE inspections of a representative sample of internal surfaces of components in the control rod drive, circulating water, and floor and equipment drains systems are performed every five years.

Credit for program activities has been taken in the aging management review of the following systems and structures.

- Gasket/seal for upper containment pool gates in containment building.
- Low pressure core spray system (LPCS) piping passing through the waterline region of suppression pool.
- Residual heat removal (RHR) system piping passing through the waterline region of suppression pool.
- Pressure relief system piping passing through the waterline region of the suppression pool.
- Reactor core isolation cooling (RCIC) system piping passing through the waterline region of the suppression pool.
- Control rod drive (CRD) system piping.
- Circulating water system piping and valve bodies.
- Floor and equipment drain system piping, drain housings, and valve bodies.
- Piping adjacent to the high pressure, intermediate pressure, and low pressure condenser shells in the circulating water system.
- High pressure core spray (HPCS) system piping passing through the waterline region of the suppression pool.
- Floor and equipment drain system piping below the waterline in the in-scope sumps.
- Moisture separator-reheater shell in the moisture separator-reheater vents and drains system.

## B.1.35 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE PROGRAM

### Program Description

There is no corresponding NUREG-1801 program.

The Periodic Surveillance and Preventive Maintenance Program is an existing program that manages aging effects not managed by other aging management programs, including loss of material due to erosion, cracking, and change in material properties.

Credit for program activities has been taken in the aging management review of the following systems and structures.

| | |
|---|---|
| Containment Building | Visually inspect and manually flex the rubber gasket/seal for upper containment pool gates to verify the absence of cracks and significant change in material properties. |

| | |
|---|---|
| Low pressure core spray system (LPCS) | Use visual or other NDE techniques to inspect external surface of LPCS piping passing through the waterline region of *suppression pool to manage loss of material.* |
| Residual heat removal (RHR) system | Use visual or other NDE techniques to inspect external surface of RHR piping passing through the waterline region of suppression pool to manage loss of material. |
| Pressure relief system | Use visual or other NDE techniques to inspect external surface of pressure relief system piping passing through the waterline region of the suppression pool to manage loss of material. |
| Reactor core isolation cooling (RCIC) system | Use visual or other NDE techniques to inspect external surfaces of RCIC system piping passing through the waterline region of the suppression pool to manage loss of material. |
| Nonsafety-related systems affecting safety-related systems | Visually inspect the internal surfaces of a representative sample of piping in the control rod drive (CRD) system to manage loss of material.<br><br>Visually inspect the internal surfaces of a representative sample of piping and valve bodies in the circulating water system (N71) to manage loss of material.<br><br>Visually inspect the internal surfaces of a representative sample of piping and valve bodies in the floor and equipment drain system (P45) to manage loss of material.<br><br>Use visual or other NDE techniques to inspect the internal surfaces of the piping adjacent to the high pressure, intermediate pressure, and low pressure condenser shells in the circulating water system (N71) to manage loss of material due to erosion.<br><br>Use visual or other NDE techniques to inspect the internal surfaces of the moisture separator-reheater in the moisture separator-reheater vents and drains system (N35) to manage loss of material due to erosion. |
| High pressure core spray (HPCS) system | Use visual or other NDE techniques to inspect HPCS piping passing through the waterline region of the suppression pool to manage loss of material. |
| Floor and equipment drain system | Use visual or other NDE techniques to inspect piping below the waterline in the in-scope sumps to manage loss of material. Visually inspect the internal surfaces of a representative sample of piping, drain housings, and valve bodies in the floor and equipment drain system (P45) to manage loss of material. |

For components within the scope of license renewal that are included in the MS-46 database and are being monitored for erosion, the following table provides the most recent inspection information (such as the date of last inspection, wall thickness data, calculated wear rate, and next scheduled inspection).

| Pipe Number or Component | ISO | Item No. | Last Inspection Date | Nominal Wall Thickness (in) | Screening Wall Thickness (in) (Note 1) | ASME Code Allowable Wall Thickness (in) (Note 1) | Measured Thickness (in) | Next Scheduled Inspection |
|---|---|---|---|---|---|---|---|---|
| 10-HBC-83 | EC-1358H | 001 | 5/16/1995 | 0.365 | 0.27375 | | (no detectable loss) | Cycle 23 |
| 10-HBC-83 | EC-1358H | 002 | 5/16/1995 | 0.365 | 0.27375 | | (no detectable loss) | Cycle 23 |
| 12-JBD-107 | EC-1331D | 001 | 10/9/2013 | 0.375 | 0.2625 | | 0.251 | (Note 4) |
| 12-JBD-107 | EC-1331D | 006 | 10/15/2013 | 0.375 | 0.2625 | | 0.226 | (Note 4) |
| 12-JBD-107 | EC-1331D | 010 | 9/25/2013 | 0.375 | 0.2625 | | 0.184 | (Note 4) |
| 12-JBD-109 | EC-1331D | 007 | 10/16/2013 | 0.375 | 0.2625 | | 0.256 | (Note 4) |
| 12-JBD-132 | EC-1331A | 006 | 9/21/2013 | 0.375 | 0.2625 | 0.145 | 0.254 | (Note 3) |
| 12-JBD-132 | EC-1331A | 007 | (N/A) | 0.375 | 0.2625 | | (N/A) | Cycle 19 |
| 12-JBD-132 | EC-1331A | 008 | 9/5/2013 | 0.375 | 0.2625 | 0.109 | 0.246 | (Note 3) |
| 12-JBD-133 | EC-1331A | 002 | 9/3/2013 | 0.375 | 0.2625 | 0.145 | 0.186 | (Note 3) |
| 12-JBD-133 | EC-1331A | 009 | (N/A) | 0.375 | 0.2625 | | (N/A) | Cycle 19 |
| 12-JBD-134 | EC-1331A | 003 | 8/29/2013 | 0.375 | 0.2625 | | 0.301 | (Note 2) |
| 12-JBD-136 | EC-1331A | 001 | 8/19/2013 | 0.375 | 0.2625 | | 0.316 | (Note 2) |
| 12-JBD-137 | EC-1331A | 004 | 8/30/2013 | 0.375 | 0.2625 | | 0.296 | (Note 2) |
| 12-JBD-137 | EC-1331A | 005 | 8/30/2013 | 0.375 | 0.2625 | 0.145 | 0.211 | (Note 3) |
| 12-JBD-137 | EC-1331A | 010 | 8/22/2013 | 0.375 | 0.2625 | 0.145 | 0.191 | (Note 3) |
| 12-JBD-152 | EC-1331E | 009 | 10/22/2013 | 0.375 | 0.2625 | | 0.236 | (Note 4) |
| 12-JBD-153 | EC-1331E | 010 | 3/24/1998 | 0.375 | 0.2625 | | 0.27 | Cycle 19 |
| 12-JBD-57 | EC-1331D | 015 | 10/2/2013 | 0.375 | 0.2625 | | 0.236 | (Note 4) |
| 12-JBD-57 | EC-1331D | 016 | 11/11/2013 | 0.375 | 0.2625 | | 0.291 | (Note 2) |
| 16-JBD-127 | EC-1331B | 001 | 9/17/2013 | 0.375 | 0.2625 | | 0.296 | (Note 2) |
| 18-HBC-81 | EC-1358A | 001 | 10/19/1999 | 0.375 | 0.28125 | | Replaced in Cycle 17 | Replaced per WO 180017 |
| 18-HBC-81 | EC-1358A | 002 | 11/14/2013 | 0.375 | 0.28125 | | 0.336 | (Note 2) |

| Pipe Number or Component | ISO | Item No. | Last Inspection Date | Nominal Wall Thickness (in) | Screening Wall Thickness (in) (Note 1) | ASME Code Allowable Wall Thickness (in) (Note 1) | Measured Thickness (in) | Next Scheduled Inspection |
|---|---|---|---|---|---|---|---|---|
| 18-HBC-81 | EC-1358B | 001 | 3/7/2001 | 0.375 | 0.28125 | | Replaced in Cycle 17 | Replaced per WO 180018 |
| 24-HBC-225 | EC-1331C | 002A | 9/16/2013 | 0.375 | 0.2625 | 0.138 | 0.229 | (Note 3) |
| 24-HBC-225 | EC-1331C | 002B | 9/17/2013 | 0.375 | 0.2625 | 0.138 | 0.260 | (Note 3) |
| 24-HBC-226 | EC-1331D | 018 | (Note 5) | 0.322 | 0.2254 | 0.162 | (Note 5) | 90 day interval until replaced |
| 24-HBC-226 | EC-1331D | 019 | 9/13/2013 | 0.322 | 0.2254 | 0.162 | 0.189 | (Note 3) |
| 24-JBD-127 | EC-1331B | 003 | 11/6/2007 | 0.375 | 0.2625 | | Replaced in Cycle 17 | Replaced in Cycle 17 |
| 24-JBD-150 | EC-1331D | 008 | 9/26/2013 | 0.375 | 0.2625 | | 0.151 | (Note 4) |
| 24-JBD-150 | EC-1331D | 009 | 9/26/2013 | 0.375 | 0.2625 | | 0.222 | (Note 4) |
| 24-JBD-77 | EC-1331B | 002 | 9/18/2013 | 0.375 | 0.2625 | | 0.282 | (Note 2) |
| 299B 2 DIA DS | EC-2358K | 001 | 2/14/2012 | 0.322 | 0.242 | | 0.304 | Cycle 19 |
| 30-HBC-224 | EC-1331C | 001 | 9/12/2013 | 0.375 | 0.2625 | 0.136 | 0.261 | (Note 3) |
| 30-JBD-77 | EC-1331B | 004 | 9/11/2013 | 0.375 | 0.2625 | | 0.278 | (Note 2) |
| 30-JBD-77 | EC-1331B | 005 | 9/12/2013 | 0.375 | 0.2625 | 0.171 | 0.236 | (Note 3) |
| | | | | | 0.2625 | 0.161 | | |
| 36-HBC-223 | EC-1331D | 020 | 9/12/2013 | 0.322 | 0.2254 | 0.154 | 0.212 | (Note 3) |
| 3-HBC-127 | EC-1358G | 009 | 11/20/13 | 0.216 | 0.162 | 0.100 | 0.141 | (Note 3) |
| 4&6-JBD-43 | EC-1331E | 015 | 5/18/2008 | 0.237 | 0.166 | 0.100 | 0.280 | Cycle 19 |
| | | | | 0.280 | 0.196 | 0.108 | | |
| 4&6-JBD-43 | EC-1331E | 016 | 11/05/2013 | 0.237 | 0.166 | 0.100 | 0.231 | (Note 2) |
| | | | | 0.280 | 0.196 | 0.108 | 0.210 | |
| 4&6-JBD-43 | EC-1331E | 018 | 5/18/2008 | 0.237 | 0.166 | 0.100 | 0.220 | Cycle 20 |
| | | | | 0.280 | 0.196 | 0.108 | | |
| 4&6-JBD-43 | EC-1331E | 020 | 11/6/2013 | 0.237 | 0.166 | 0.100 | 0.222 | (Note 2) |
| | | | | 0.280 | 0.196 | 0.108 | | |
| 6-JBD-121 | EC-1331D | 011 | 9/19/2013 | 0.280 | 0.196 | | 0.238 | (Note 2) |
| 6-JBD-378 | EC-1331E | 014 | N/A | 0.280 | 0.196 | 0.106 | N/A | Cycle 19 |

| Pipe Number or Component | ISO | Item No. | Last Inspection Date | Nominal Wall Thickness (in) | Screening Wall Thickness (in) (Note 1) | ASME Code Allowable Wall Thickness (in) (Note 1) | Measured Thickness (in) | Next Scheduled Inspection |
|---|---|---|---|---|---|---|---|---|
| 6-JBD-43 | EC-1331E | 001 | 10/30/2013 | 0.280 | 0.196 | | 0.222 | (Note 2) |
| 6-JBD-43 | EC-1331E | 002 | 10/29/2013 | 0.280 | 0.196 | | 0.280 | (Note 2) |
| | | | | 0.237 | 0.166 | | 0.187 | |
| 6-JBD-43 | EC-1331E | 003 | 10/24/2013 | 0.280 | 0.196 | | 0.256 | (Note 2) |
| | | | | 0.237 | 0.166 | | 0.236 | |
| 6-JBD-43 | EC-1331E | 011 | N/A | 0.280 | 0.196 | | N/A | Cycle 20 |
| 6-JBD-43 | EC-1331E | 012 | 10/24/2013 | 0.280 | 0.196 | | 0.216 | (Note 2) |
| | | | | 0.322 | 0.225 | | 0.281 | |
| 6-JBD-43 | EC-1331E | 017 | 11/12/2013 | 0.280 | 0.196 | 0.108 | 0.186 | (Note 3) |
| 6-JBD-43 | EC-1331E | 019 | 5/18/2008 | 0.280 | 0.196 | 0.108 | 0.240 | Cycle 20 |
| 8"-JBD-155 | EC-1331E | 021 | 11/20/2008 | 0.322 | 0.2254 | 0.073 | 0.080 | To be replaced in Cycle 19 |
| 8"-JBD-155 | EC-1331E | 022 | 11/13/2008 | 0.322 | 0.2254 | 0.100 | thru wall leak | (Replaced in cycle 17) |
| 8"-JBD-155 | EC-1331E | 023 | 11/20/2008 | 0.322 | 0.2254 | 0.106 | 0.085 | To be replaced in Cycle 19 |
| 8-JBD-112 | EC-1331D | 004 | 10/11/2013 | 0.322 | 0.2254 | | 0.203 | (Note 4) |
| 8-JBD-114 | EC-1331D | 003 | 10/3/2013 | 0.322 | 0.2254 | | 0.185 | (Note 4) |
| 8-JBD-114 | EC-1331D | 005 | 10/3/2013 | 0.322 | 0.2254 | | 0.202 | (Note 4) |
| 8-JBD-156 | EC-1331E | 006 | 10/31/2013 | 0.322 | 0.2254 | | 0.229 | (Note 2) |
| 8-JBD-156 | EC-1331E | 007 | 10/23/2013 | 0.322 | 0.2254 | | 0.286 | (Note 2) |
| 8-JBD-156 | EC-1331E | 008 | 10/17/2013 | 0.322 | 0.2254 | 0.075 | 0.214 | (Note 3) |
| 8-JBD-378 | EC-1331D | 002 | 10/8/2013 | 0.322 | 0.2254 | | 0.226 | (Note 2) |
| 8-JBD-378 | EC-1331D | 013 | 9/24/2013 | 0.322 | 0.2254 | | 0.214 | (Note 4) |
| 8-JBD-378 | EC-1331D | 014 | 11/11/13 | 0.322 | 0.2254 | | 0.216 | (Note 4) |
| 8-JBD-57 | EC-1331D | 012 | 9/24/2013 | 0.322 | 0.2254 | | 0.266 | (Note 2) |
| 1N19B007A | EC-1360 | HB1 | 11/6/1996 | 1.25 | 0.875 | | 1.208 | (Note 2) |
| 1N19B007A | EC-1360 | HB2 | 11/6/1996 | 0.875 | 0.6125 | | 0.833 | (Note 2) |
| 1N19B007A | EC-1360 | HBT | 11/9/1996 | 1.25 | 0.875 | | 1.238 | (Note 2) |

| Pipe Number or Component | ISO | Item No. | Last Inspection Date | Nominal Wall Thickness (in) | Screening Wall Thickness (in) (Note 1) | ASME Code Allowable Wall Thickness (in) (Note 1) | Measured Thickness (in) | Next Scheduled Inspection |
|---|---|---|---|---|---|---|---|---|
| 1N19B007B | EC-1360 | IA1 | 11/6/1996 | 1.25 | 0.875 | | 1.174 | (Note 2) |
| 1N19B007B | EC-1360 | IA2 | 11/6/1996 | 0.875 | 0.6125 | | 0.861 | (Note 2) |
| 1N19B007B | EC-1360 | IAT | 11/9/1996 | 1.25 | 0.875 | | 1.257 | (Note 2) |
| 1N19B007B | EC-1360 | IB1 | 11/6/1996 | 1.25 | 0.875 | | 1.223 | (Note 2) |
| 1N19B007B | EC-1360 | IB2 | 11/6/1996 | 0.875 | 0.6125 | | 0.755 | (Note 2) |
| 1N19B007B | EC-1360 | IBT | 11/9/1996 | 1.25 | 0.875 | | 1.247 | (Note 2) |
| 1N19B007C | EC-1360 | LA1 | 11/6/1996 | 1.25 | 0.875 | | 1.203 | (Note 2) |
| 1N19B007C | EC-1360 | LA2 | 11/6/1996 | 0.875 | 0.6125 | | 0.862 | (Note 2) |
| 1N19B007C | EC-1360 | LAP1 | 11/9/1996 | 0.625 | 0.4375 | | 0.741 | (Note 2) |
| 1N19B007C | EC-1360 | LAT | 11/6/1996 | 1.25 | 0.875 | | 1.254 | (Note 2) |
| 1N19B007C | EC-1360 | LB1 | 11/6/1996 | 1.25 | 0.875 | | 1.161 | (Note 2) |
| 1N19B007C | EC-1360 | LB2 | 11/6/1996 | 0.875 | 0.6125 | | 0.724 | (Note 2) |
| 1N19B007C | EC-1360 | LB3 | 11/6/1996 | 0.625 | 0.4375 | | 0.661 | (Note 2) |
| 1N19B007C | EC-1360 | LB4 | 11/6/1996 | 0.625 | 0.4375 | | 0.656 | (Note 2) |
| 1N19B007C | EC-1360 | LBT | 11/9/1996 | 1.25 | 0.875 | | 1.247 | (Note 2) |

N/A: Not available.

Note 1: Table entries for Screening Wall Thickness are a percentage of nominal wall thickness, i.e. 70% of nominal thickness for nonsafety-related components and 75% of nominal wall thickness for safety-related components. ASME Code allowable wall thickness is calculated assuming the entire circumference of the pipe has the same thickness. For localized wall thinning, calculation of a minimum required wall thickness will yield a lower value.

Note 2: Measured wall thickness is greater than the screening wall thickness value. Next scheduled inspection date to be determined.

Note 3: Measured wall thickness is less than the screening wall thickness value, but greater than the ASME Code allowable wall thickness. Next scheduled inspection date to be determined

Note 4: Measured wall thickness is less than the screening wall thickness. However, based on experience with similar class piping evaluations, calculation of ASME Code allowable wall thickness is expected to show components are acceptable. Dates for the next schedule inspection will be determined following completion of pending evaluations.

Note 5: A through-wall leak was identified August 30, 2013. Temporary soft patch was applied and piping was evaluated and determined acceptable until the next scheduled refueling outage during which, the affected piping will be replaced. In the interim, inspections

are performed at least once every 90 days.

Wall thickness for each safety-related piping component identified in the table above is greater than the screening wall thickness with one exception. A through-wall leak was found on Component 24-HBC-226, item 18, in August, 2013. A temporary soft patch was applied and the piping was evaluated and determined acceptable until the next scheduled refueling outage during which, the affected piping will be replaced. In the interim, inspections are performed at least once every 90 days. Results of inspections of safety-related piping components, along with corrective actions instituted in response to the leak in Component 24-HBC-226, provide reasonable assurance that the safety-related piping components remain capable of performing their intended functions.

Most nonsafety-related components identified in the table have been examined with ultrasonic testing (UT) to determine wall thickness. The results of all examinations performed on nonsafety-related components in 2013 have been reviewed by Design Engineering and found acceptable based on low system pressures and piping loads. Of the components that were not inspected in 2013, some were recently replaced and others are scheduled for inspection within the next two refueling cycle intervals, The last group of components in the table beginning with 1N19 are portions of the circulating water piping near the condenser waterboxes. Few of the results from the last inspections in 1996 showed any substantial wall thinning. Dates for next scheduled inspections of these components are to be determined.

The ASME Code allowable wall thickness for all nonsafety-related components inspected in 2013 will be provided by Design Engineering in 2014. Based on experience with similar piping in similar applications, Design Engineering has concluded there is reasonable assurance that the affected nonsafety-related piping components remain capable of performing their intended functions.

During development of this response, deficiencies were identified in the database developed and maintained in accordance with GGNS-MS-46. These deficiencies have prevented determination of appropriate dates for the next inspection of some components. This condition has been entered into the GGNS corrective action program. Corrective actions will result in determination of appropriate dates for the next inspection of components in the database. This will also include determination of ASME Code allowable wall thicknesses.

**Response to request 4:**

The revision to MS-46 that was previously entered into the corrective action program was limited to updating the scope to include systems that are susceptible to microbiologically induced corrosion (MIC) with flowing medium. Enhancements for the management of loss of material due to erosion, as shown in the responses to requests 1, 2, and 3 of this RAI and in the responses to RAI B.1.22-1a in letter GNRO-2012/00114 dated 10-02-2012 and RAI B.1.22-1b in letter GNRO-2012/00156 dated 12-18-2012, for the LRA B.1.22 Flow-Accelerated Corrosion Program , the LRA B.1.35 Periodic Surveillance and Preventive Maintenance Program , and the LRA B.1.41 Service Water Integrity Program ,will be implemented prior to May 1, 2024. Implementation of these enhancements may involve revisions to existing procedures such as MS-46 or creation of new procedures. Implementation of these enhancements should be verified as part of NRC Inspection Procedure 71003, "Post-Approval Site Inspection for License Renewal," regardless of the specific implementing procedures.

**RAI B.1.22-1c, Flow-Accelerated Corrosion follow-up**

Background:

The GGNS response to RAI B.1.22-1b, dated December 18, 2012, provides additional bases to justify the exception to the Flow-Accelerated Corrosion (FAC) program for managing wall thinning caused by non-FAC mechanisms. For the "detection of aging effects" program element, GGNS stated that the "FAC program includes a quarterly review of plant conditions to identify conditions outside of design conditions that could affect plant piping and equipment due to FAC or erosion," and that the "corrective action process performs extent of condition reviews for component degradation that would be the result of loss of material due to erosion." For the "monitoring and trending" program element, GGNS stated that monitoring for erosion mechanisms is currently performed through a review of plant-specific and industry operating experience. For the "corrective action" program element, GGNS stated that the "corrective action program evaluation of the condition will determine the appropriate corrective action," and "if degradation is due to erosion, it is not acceptable to only replace with FAC or erosion resistant material: monitoring the replaced component at an appropriate frequency is warranted."

The staff noted that, although the implementing procedure, EN-DC-315, "Flow Accelerated Corrosion Program," states that it can be used as a guide for evaluating systems and components that are not included in the FAC program, there did not appear to be any other distinctions in the procedure relative to managing non-FAC wall-thinning mechanisms. In addition, the staff noted in its response to RAI B.1.22-1a, dated October 2, 2012, GGNS stated that FAC location 662, which was being managed for non-FAC wall thinning mechanisms, "was replaced in 2004 with FAC-resistant material (stainless steel) and is no longer monitored for FAC."

In the response dated August 8, 2013, to follow-up actions from a teleconference on August 1, 2013, GGNS stated that the implementing procedure EN-DC-315, with sub-tier procedures SEP-FAC-GGN-001, CEP-FAC-001, and GGNS MS-41, provide the details for performing inspections to monitor wall thinning due to FAC and non-FAC mechanisms. The response also adds a commitment to continue periodic monitoring of components that are subject to wall-thinning mechanisms other than FAC, which are replaced with alternate materials, at a

frequency commensurate with their post-replacement wear rates and post replacement cumulative run hours.

Issue:

Although the staff had preliminarily accepted GGNS' October 2, 2012, and December 18, 2012, responses, after additional considerations several aspects are not clear to the staff with respect to how the current FAC program manages components that are being monitored for non-FAC wall-thinning mechanisms. Specifically, the program apparently relies exclusively on the corrective action process/program to provide extent of condition reviews and corrective actions, and the implementing procedures do not appear to provide any guidance in either aspect.

As noted in response to RAI B.1.22-1a, FAC location 662 was replaced with stainless steel and is no longer being monitored by the FAC program. Although the commitment provided in the August 8, 2013, letter will now require periodic monitoring of this component, the implementing procedure provided during the NRC's AMP audit for the FAC program did not distinguish between components that are being monitored for FAC and those being monitored for non-FAC mechanisms. Unless the procedure differentiates between components that being managed for FAC and non-FAC mechanisms, it is not clear that post-replacement activities to determine new wear rates and to track cumulative run hours will be performed.

From the "detection of aging effects" perspective, although the current implementing procedure includes a reference to EPRI-1011231, "Recommendations for Controlling Cavitation, Flashing, Liquid Droplet Impingement, and Solid Particle Erosion in Nuclear Power Plant System," the procedure does not address any considerations for extent of condition reviews. It is not clear how extent of condition reviews performed through the corrective action process will appropriately consider recommendations for controlling erosion mechanisms without giving guidance through the implementing procedure. In addition, the staff could not identify where the FAC program includes a quarterly review of plant conditions to identify conditions that could affect piping and equipment due to FAC or erosion, as stated in the December 18, 2012 response to RAI B.1.22-1b.

Request:

1. Provide additional bases to justify the current exception for using the FAC program to manage components susceptible to non-FAC mechanism. Either include details from the existing implementing procedure(s) to demonstrate that the effects of aging will be adequately managed with respect to a) performing extent of condition reviews, b) replacing components susceptible to wall-thinning mechanisms other than FAC with FAC-resistant material, and c) tracking cumulative run hours for components affected by non-FAC wall thinning, or provide a commitment to enhance the implementing procedures to accomplish these activities. Also include any other aspects of the ten program elements that should be addressed.
2. Explain how the existing FAC program described in LRA B.1.22 provides "a quarterly review of plant conditions to identify conditions outside of design conditions that could affect plant piping and equipment due to FAC or erosion."

**RESPONSE TO RAI B.1.22-1c**

**Response to Request 1:**

The GGNS Flow-Accelerated Corrosion (FAC) Program includes components that have been added to the program based on extent of condition reviews. For example, low pressure core spray and high pressure core spray pump minimum flow lines have been inspected under the FAC Program in response to degradation discovered in the residual heat removal system minimum flow lines. The program implementing procedures include directions for sample expansion to bound the extent of wall thinning based on wall loss meeting prescribed criteria. The extent of condition reviews under the corrective action program together with the sample expansion provisions of the FAC Program implementing procedures are effective measures for ensuring that appropriate components are included in the FAC Program based on plant and industry operating experience with wall thinning due to erosion. Entergy has determined that additional FAC Program guidance is appropriate to address components susceptible to non-FAC wall thinning mechanisms that are replaced with FAC-resistant materials. The FAC Program includes measures to track cumulative run hours for individual components. These measures apply to all components that are monitored under the FAC Program, including those monitored for loss of material due to erosion, and include consideration of dates of component replacements.

To provide the additional guidance in the FAC Program to address replacement of components susceptible to non-FAC wall thinning mechanisms, LRA Sections A.1.22 and B.1.22 are revised as described in the response to RAI B.1.41-3c request 2 provided above.

**Response to Request 2:**

The FAC Program implementing procedures specify that plant operating experience is reflected in updates to the predictive model and in selection of components to include in each outage inspection plan. To implement this direction, on a quarterly basis, GGNS issues a repetitive task to the FAC engineer to review and identify plant conditions that could affect plant piping and equipment from a FAC Program perspective. Such conditions may include valves leaking by the seat, abnormal valve alignments, or equipment operating for significantly longer periods of time than normal. The frequent operation of the RHR minimum flow lines that led to piping erosion is provided as an example of a line that operated more frequently than normal.